NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

GRASSED WATERWAY

(Acre)

CODE 412

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- to convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding
- to reduce gully erosion
- to protect/improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

In areas where added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices.

This practice does not apply where the present watercourse is not seriously eroding.

This standard applies to 2.0 square mile or smaller waterway drainage areas in South Dakota (SD) Technical Guide Eastern Area or to 1.0 square mile or smaller watersheds elsewhere in the state. SD standard Open Channel (582) applies to larger watersheds.

CRITERIA

General Criteria Applicable to All Purposes

Grassed waterways shall be planned, designed, and constructed to comply with all federal, state, and local laws and regulations. Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

Capacity. The minimum capacity shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration. When the waterway slope is less than one percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum size of the waterway in such cases shall be the capacity required to remove the water before crops are damaged.

The capacity of the waterway shall be based upon the expected retardance of the vegetation typical in a dense, well established and deep rooted stand. This is generally B or C but may range from A to D depending on the species and management of the vegetation.

Velocity. Design velocities shall not exceed those obtained by using the procedures, “n” values, and recommendations in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-lined Open Channels.

Design velocities for waterways must be based on "D" (low vegetal) retardance and Table 1.

Table 1. Maximum Velocities (feet/second)

Vegetation, Slope	***Easily Eroded Soils (K>0.35)***	***Erosion Resistant Soils (K<0.35)***
Poor veg. Slope 0-5%	*2.5*	*3.5*
Good veg.		

Slope 0-5%	*5.0*	*7.0*
Slope >5%	*3.5*	*5.5*

Width. Waterway cross sections shall be either parabolic or trapezoidal. Trapezoidal waterways wider than 100 foot bottom width, must consist of multiple or divided waterways or other means must be provided to prevent meandering of low flows.

Side slopes. Side slopes shall not be steeper than a ratio of two horizontal to one vertical. They shall be designed to accommodate the equipment anticipated to be used for maintenance and tillage/harvesting equipment that will cross the waterway.

Depth. The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at, or below the design water surface elevation in the tributary channel, at their junction when both are flowing at design depth.

Freeboard above the designed depth shall be provided when flow must be contained to prevent damage. Freeboard shall be provided above the designed depth when the vegetation has the maximum expected retardance.

The main section of the waterway shall have a constructed depth of not less than one foot. The inlet and outlets may be less than one foot deep to allow for the transition to natural ground.

Wet areas. Water-tolerant vegetation (reed canary grass, etc.), rock chute spillways, or other measures must be provided where needed to control erosion in areas with seepage, prolonged flow, or a high water table. These measures must meet applicable NRCS conservation practice standards.

Outlets. All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earthen ditch, a grade-stabilization structure, filter strip or other suitable outlet.

Vegetative Establishment. Grassed waterways shall be vegetated according to NRCS Conservation Practice Standard Critical Area Planting, (342.) mulch shall meet Mulching (484).

To avoid excessive erosion, timing of waterway construction must allow seeding within 30 days of completion of construction. Seeding can only be performed at times of the year specified under the standard for Critical Area Planting (342).

CONSIDERATIONS

Recommended minimum velocity to avoid sediment deposition during design flow is two feet per second. Waterways designed for velocities less than two feet per second will require more maintenance and have a shorter effective life.

Consider using mulch anchoring, nurse crop, rock, straw, or hay bale dikes, filter fences, or runoff diversion to protect the vegetation until it is established.

Important wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting the grassed waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of grassed waterways so they do not interfere with hydraulic functions. Mid- or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat. Waterways with these wildlife features are more beneficial when connecting other habitat types; e.g., riparian areas, wooded tracts and wetlands.

Grass buffers along the sides of grassed waterways are strongly recommended to reduce sediment deposition and extend waterway life.

Water-tolerant vegetation may be an alternative on some wet sites.

Use irrigation in dry regions or supplemental irrigation as necessary to promote germination and vegetation establishment.

Provide livestock and vehicular crossings as necessary to prevent damage to the waterway and its vegetation.

Establish filter strips on each side of the waterway to improve water quality.

Add width of appropriate vegetation to the sides of the waterway for wildlife habitat.

PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterways shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

OPERATION AND MAINTENANCE

An Operation and Maintenance Plan shall be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.

Seeding shall be protected from concentrated flow and grazing until vegetation is established.

Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods.

Inspect grassed waterways regularly, especially following heavy rains. Damaged areas will be filled, compacted, and seeded immediately. Remove sediment deposits to maintain capacity of grassed waterway.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover.

Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition.

Control noxious weeds.

Do not use as a field road. Avoid crossing with heavy equipment when wet.

REFERENCES

SCS-TP-61, Handbook of Channel Design for Soil and Water Conservation

Soil Interpretations in Section II of the SDTG

FOCS, Technical Soils Report

ARS Agricultural Handbook Number 667, Stability Design of Grass-Lined Open Channels